FREE-LIVING NEMATODES FROM SOUTH AFRICA

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SYNOPSIS

Five new species of free-living nematodes are described from the mouth of the Greater Kleinemonde River, Cape Province, South Africa. They are named: *Trissonchulus janetae*, *Mesonchium nini*, *Hypodontolaimus angelae*, *Polygastrophora omercooperi* and *Sphaerolaimus anterides*. *Trissonchulus* Cobb, 1920 is accepted as a valid genus with six species: *T. oceanus* Cobb, 1920 (type species); *T. obtusus* (Bresslau and Schuurmans Stekhoven, 1935) comb. nov.; *T. nudus* (Schuurmans Stekhoven, 1943) comb. nov.; *T. reversus* Chitwood, 1951; *T. latus* (Wieser, 1953) comb. nov.; *T. janetae* sp. nov. Wieser's (1954*b*) treatment of *Pepsonema* Cobb, 1920 as a synonym of *Mesonchium* Cobb, 1920, is accepted but his treatment of *Spilophora canadensis* Cobb, 1914, as a synonym of *Hypodontolaimus geophila* (de Man, 1876) is not. *S. canadensis* is considered a *species inquirendum*. *Bolbella cylindricauda* Allgén, 1959 is shown to be a species of *Polygastrophora* and is treated as a synonym of *P. hexabulba* (Filipjev, 1918).

PROFESSOR J. OMER-COOPER made a small collection of free-living nematodes at the mouth of the Greater Kleinemonde River in the Bathurst District of Cape Province, Union of South Africa. Fuller details of this locality have been given by Omer-Cooper (1957*a*; 1957*b*) but it may be noted here that the mouth of the river is closed by a sandbar for much of each year and, sometimes, continuously for more than one year. Behind the bar a lagoon is formed the salinity of which " . . . is normally between 23·3 and 34·0 per mille, but it has reached 41·2 per mille during a long drought . . . " (Omer-Cooper, 1957*a*). The nematodes were collected by sieving mud and, as their collection was not the primary object of the survey, the majority of the specimens are large. Nevertheless seven species (and genera) are represented, but two are insufficiently preserved to warrant a full study. They could be identified to genera but are not listed as the literature already contains too many references to genera only. Further the genera are cosmopolitan and frequent in occurrence so that it is not surprising that species referable to them should occur in South Africa and as the species are almost certainly common they will be found again. The remaining five species, all previously unknown, are described here as new, and are all referable to existing genera.

The five species are:

Trissonchulus janetae sp. nov. (p. 294).
Mesonchium nini sp. nov. (pp. 301).
Hypodontolaimus angelae sp. nov. (pp. 305).
Polygastrophora omercooperi sp. nov. (pp. 309).
Sphaerolaimus anterides sp. nov. (pp. 313).

These species, although taken in brackish water, belong to genera which are otherwise known only from wholly marine localities. This does not indicate anything of importance since it is already fairly well established that characteristically marine nematodes can occur in brackish water, such habitats usually having a mixture of marine and fresh-water forms. That all five species are marine forms is not surprising since they were collected by sieving mud and under such circumstances one would expect only the larger forms to be gathered. The number of specimens in the collection and their sizes support this. Since the marine species are generally larger than fresh-water or soil forms their sole presence in the samples from Kleinemonde is a reflection of the collecting method used rather than of the fauna present. No conclusions of a zoo-geographical nature may be drawn since, as the present collection well demonstrates, free-living marine nematodes are insufficiently known on a world basis to make such an exercise either interesting or profitable (see also Chitwood (1951) who makes the same point).

Trissonchulus janetae sp. nov.

Material Studied

60 + ♂; 60 + ♀; 30+ larvae. B.M. (N H.), Reg. Nos. 1960.123–272. 1 ♂ selected as Holotype, 1960.123.

Proportions and Measurements (mm.)

	a	*b*	*c*	V	Body length
♂♂	39·9	4·9	32·3	—	3·55
	39·6	4·9	28·7	—	3·84
	39·2	5·2	31·0	—	3·88
	43·4	5·7	31·1	—	4·08
	47·1	5·9	34·2	—	4·10
	48·2	5.8	31·7	—	4·53
	48·7	6·0	32·0	—	4·58
♀♀	39·7	5·3	34·2	54·4	4·10
	39·8	5·4	31·5	56·1	4·10
	36·6	5·3	31·5	55·7	4·13
	41·7	5·1	32·6	57·0	4·30
	45·0	5·7	31·6	56·0	4·68
	41·0	5·8	30·7	53·8	4·72
	45·3	6·1	29·3	55·2	4·98
Larvae	36·2	4·0	23·6	—	2·10
	43·3	4·6	28·6	—	3·38
	42·7	5·3	29·1	—	3·54

Males (all measurements in the order of the body lengths): Oesophagus length: 0·72; 0·78; 0·74; 0·71; 0·69; 0·78; 0·76. Pharyngeal-rod length: 0·092; 0·094; 0·097; 0·087; 0·098; 0·089; 0·087. Head diameter (level at anterior edge of amphid): 0·033; 0·034; 0·032; 0·034; 0·032; 0·033; 0·036. Amphid width (head diameter/amphid width): 0·090 (3·7); 0·090 (3·8); 0·010 (3·2); 0·010 (3·4);

0·009 (3·6) ; 0·010 (3·3) ; 0·009 (4·0). Amphid length : 0·010 ; 0·010 ; 0·010 ; 0·009 ; 0·010 ; 0·010 ; 0·011. Amphid from anterior end (=depth of cephalic cap) : 0·021 ; 0·019 ; 0·018 ; 0·019 ; 0·012 (teeth strongly retracted) ; 0·020 ; 0·022. Excretory pore from anterior end : 0·024 ; ... ; 0·023 ; ... ; 0·021 ; ... ; 0·029. Nerve ring from anterior end : 0·25 ; 0·23 ; 0·26 ; 0·28 ; 0·23 ; 0·31 ; 0·38. Tail length (tail length/anal diameter) : 0·110 (1·6) ; 0·133 (1·9) ; 0·125 (1·7) ; 0·131 (1·7) ; 0·120 (2·0) ; 0·143 (2·0) ; 0·143 (1·9). Spicule length : 0·093 ; 0·096 ; 0·097 ; 0·104 ; 0·097 ; 0·098 ; 0·099. Gubernaculum length : 0·047 ; 0·055 ; 0·055 ; 0·062 ; 0·056 ; 0·058 ; 0·060.

Females : Oesophagus length : 0·78 ; 0·76 ; 0·78 ; 0·84 ; 0·82 ; 0·81 ; 0·82. Pharyngeal rod length : 0·091 ; 0·082 ; 0·097 ; 0·086 ; 0·087 ; 0·085 ; 0·097. Head diameter (level at anterior edge of amphid) : 0·031 ; 0·034 ; 0·030 ; 0·036 ; 0·034 ; 0·035 ; 0·034. Amphid width (head diameter/amphid width) : 0·009 (3·4) ; 0·010 (3·4) ; 0·009 (2·2) ; ... (...) ; 0·010 (3·4) ; 0·009 (3·9) ; 0·010 (2·4). Amphid length : 0·010 ; 0·011 ; 0·009 ; ... ; 0·010 ; 0·009 ; 0·011. Amphid from anterior end (= depth of cephalic cap) : 0·019 ; 0·015 ; 0·018 ; 0·019 ; 0·022 ; 0·023 ; 0·017. Nerve ring from anterior end : 0·25 ; 0·36 ; ... ; ... ; 0·27 ; 0·29 ; 0·32. Excretory pore from anterior end : 0·020 ; ... ; ... ; ... ; 0·021 ; 0·022 ; 0·022. Tail length (tail length/anal diameter) : 0·120 (1·7) ; 0·130 (1·9) ; 0·131 (1·9) ; 0·132 (1·8) ; 0·148 (2·1) ; 0·154 (1·9) ; 0·170 (2·2). Vulva from anterior end : 2·2 ; 2·3 ; 2·3 ; 2·5 ; 2·6 ; 2·5 ; 2·8.

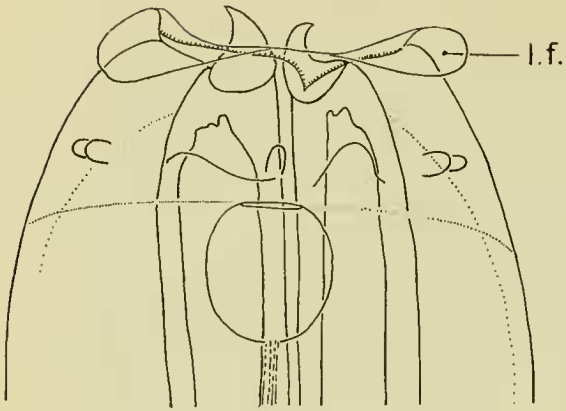
Larvae : Oesophagus length : 0·52 ; 0·74 ; 0·67. Pharyngeal-rod length : 0·060 ; 0·074 ; 0·081. Head diameter (level at anterior edge of amphid) ; 0·033 ; 0·031 ; 0·044. Amphid width (head diameter/amphid width) ; 0·077 (4·7) ; 0·070 (4·4) ; 0·080 (5·6). Amphid length : 0·009 ; 0·009 ; 0·009. Amphid from anterior end (= depth of cephalic cap) : 0·014 ; 0·016 ; 0·017. Nerve ring from anterior end : 0·19 ; 0·25 ; 0·27. Excretory pore from anterior end : ... ; 0·024 ; 0·027. Tail length (tail length/anal diameter) : 0·089 (2·0) ; 0·118 (2·1) : 0·122 (2·0). Secondary teeth from anterior end : 0·019 ; 0·023 ; 0·016.

Cuticle

The cuticle is smooth without markings.

Head and Oesophagus

The head bears an inner circle of six small, sessile papillae and an outer circle of ten prominent papillae of which four are markedly larger than the others (Text-figs. 2 and 4). Laterally, between the lateral papillae of the inner and outer circles, is another structure, pore-like in appearance, which appears to correspond with the cephalic slits found in the Enoploidea. Such slits do not appear to have been reported from this genus before. The mouth opening is closed by three rather thin lip-flaps. The anterior end of the oesophagus bears a pair of smallish, wholly cuticular teeth dorsally and a single, larger, comparable tooth on each ventro-lateral sector (Text-figs. 1, 3 and 5). The anterior edges of the lumen of the oesophagus bear a row of small denticles exactly the same in appearance and distribution as the denticles



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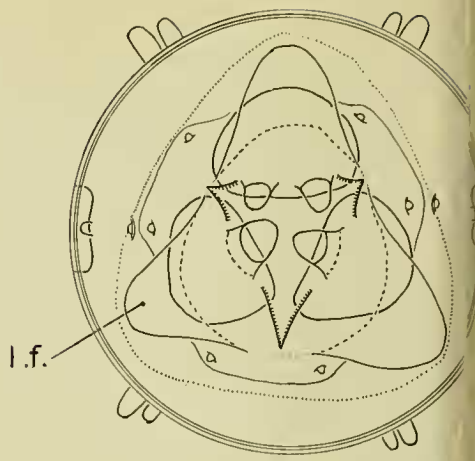

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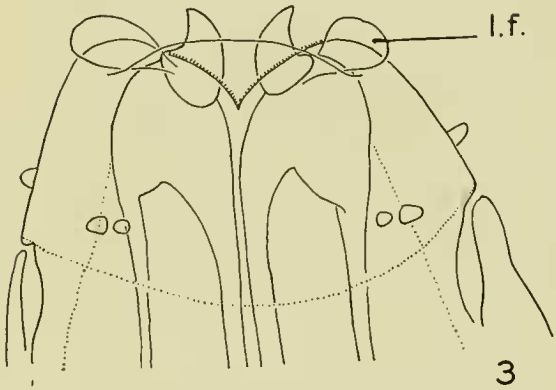

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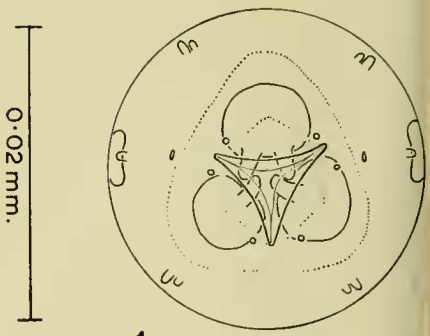

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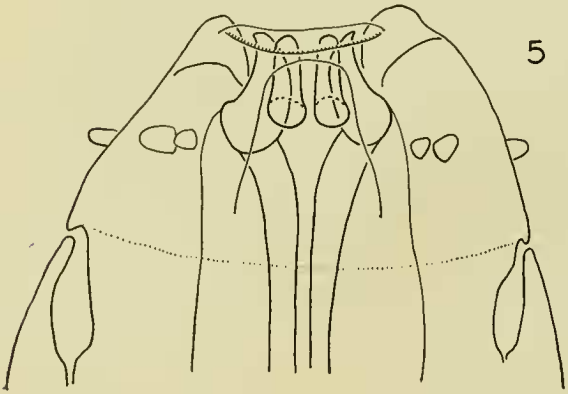

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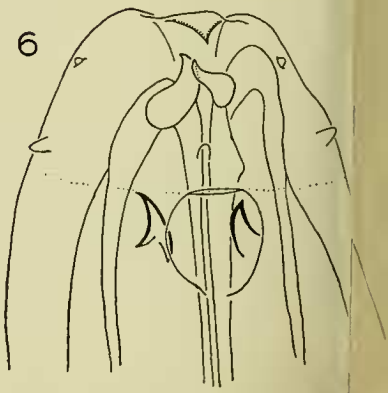

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found within the mouth of species of the genus *Enoplus*. When the mouth is open the teeth are pulled anteriorly so that they project through the mouth opening and the lip-lobes are folded back over the head (Text-figs. 1, 2 and 3, l.f.). When the mouth is closed the two ventro-lateral teeth come together to lie between the two-dorsal teeth (Text-fig. 4). The amphids are pouch-like and their anterior edges lie exactly on the posterior edge of the cephalic cap.

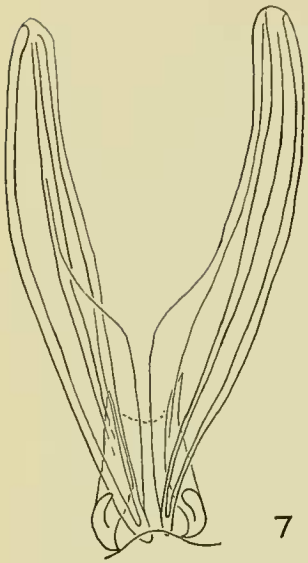
The oesophagus expands evenly along its length so that there is no definite posterior swelling or bulb. Anteriorly it is modified as a distinct pharynx lined by very distinct cuticular rods, here called pharyngeal-rods. The posterior ends of the pharyngeal-rods are very distinct and blunt (Text fig. 8). The musculature surrounding the rods is directed antero-radially rather than wholly radially as it is in the remainder of the oesophagus. The pharyngeal region is not markedly stouter than the rest of the oesophagus in most specimens but it does swell out in some. It is probable that the swollen condition is the more natural since the specimens appear to have been stretched during fixation. The extreme anterior end of the pharynx, from about the level of the amphids, is capped by cuticle (= pharyngeal capsule) and is fused to the body-wall dorsally and ventro-laterally (i.e. at three points). A definite, although indistinct, cephalic capsule is present which coincides posteriorly with the anterior limits of the amphids but I have been unable to determine the anterior limits i.e. there is no definite stomodaeal ring (terminology of Wieser, 1954*a*). Because of this fusion of the pharynx with the body cuticle the pharynx is triangular in cross section (Text-figs. 2 and 4).

In the larvae there is, in all the specimens studied (about twenty), a second set of teeth lying about the level of the amphids (Text fig. 6). These teeth are identical in structure and number with those found anteriorly. The dorsal are about 0·005 mm. long while the ventro-lateral are about 0·008 mm. long. In one specimen which appeared to be otherwise fully adult, with fully developed spicules, gubernaculum and reproductive system (body length 4·08 mm.) such a second set of teeth was present, 0·021 mm. from the anterior end. This I have interpreted as an abnormality and have included the measurements of the specimen under the males.

Tail

The tail is relatively very short ($c = 28{\cdot}7 - 34{\cdot}2$ in the adults), and ends bluntly posteriorly, particularly in the adults as there is a tendency for it to be more rounded in the larvae and smaller adults. The spinerette opens dorsally (Text-figs. 11 and 13)

FIGS. 1–6. *Trissonchulus janetae* sp. nov., the structure of the head. Fig. 1. Lateral view of adult head with the dorsal side towards the right. The mouth is open and the lip-flaps are folded back over the anterior end of the body. Fig. 2. *En face* view of adult head with mouth open and lip-flaps folded back. Fig. 3. Head, as Fig. 1, from the ventral aspect. Fig. 4. *En face* view of larval head. The mouth is closed, note the relationships between the dorsal and ventro-lateral teeth. Fig. 5. Head, as Figs. 1 and 3, from the dorsal aspect. Fig. 6. Larval head from the lateral aspect with dorsal side to the right. Note secondary teeth. (All figures to the same scale.) (l.f. = lip-flaps.)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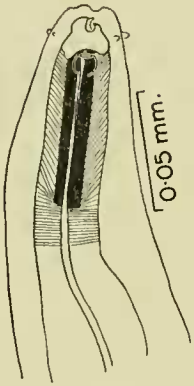
0·05 mm.
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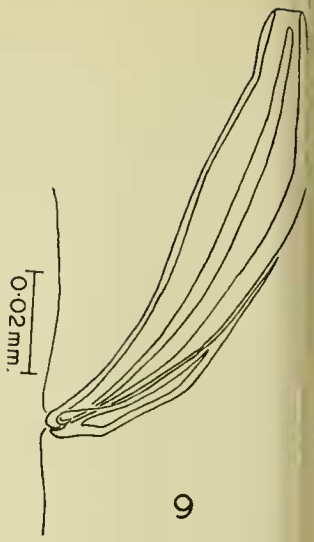
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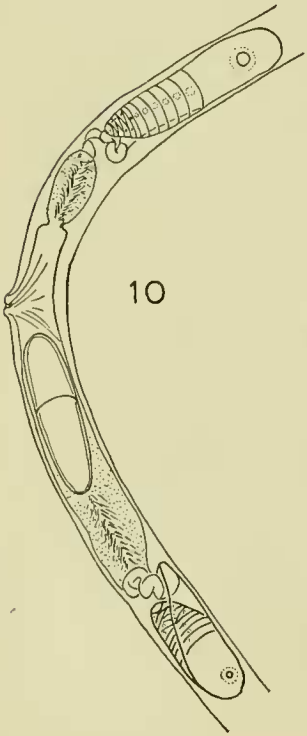
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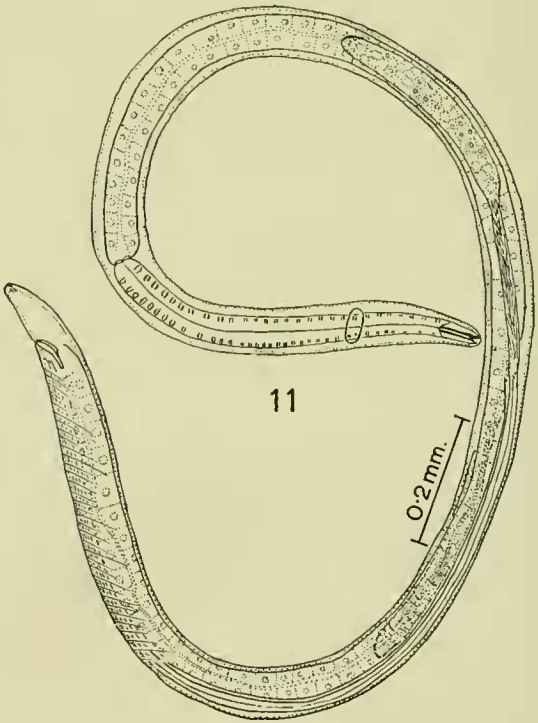
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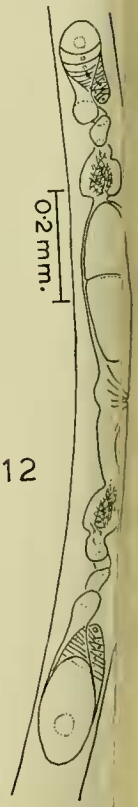
0·2 mm.


0·2 mm.
12

and there are several sessile papillae scattered over the surface in both males and females, but there are no setae.

Male

The spicules are short, equal in length, stout and complicated, with blunt posterior tips. They show a distinct central bar of thickening from which alae appear to arise when they are viewed from the ventral aspect (Text-fig. 7). The gubernaculum is relatively short and is indistinct anteriorly. Posteriorly it is thick and is developed into two claw-like structures which enfold the spicules and also appear to support the posterior edge of the cloacal opening (Text-figs. 7 and 9). There are no special caudal papillae or pre-cloacal supplements but there is a series of muscle bands running from the dorso-lateral part of the body ventrally and posteriorly. These bands occur over a region equal in length to about one third of the length of the body.

There are two opposed testes of which the anterior is slightly longer than the posterior. They lead into a pair of long narrow seminal vesicles from the junction of which a very thick-walled vas deferens runs posteriorly to the cloaca (Text-fig. 11). The seminal vesicles contain flagellate sperm (see Chitwood & Chitwood, 1951, p. 156 and fig. 125M).

Female

The reproductive apparatus, which consists of two opposed uteri with associated reflexed ovaries, is relatively short in proportion to the length of the body. Thus, from four specimens the following lengths, in mm., of the entire length of the reproductive tract were obtained: length of reproductive tract: body length (body length/length reproductive tract): 1·2 : 4·7 (3·9); 1·8 : 4·7 (2·6); 1·2 : 4·1 (3·4); 1·4 : 4·3 (3·1). The ovaries lead into relatively long narrow oviducts which are modified, just before they join the uteri, as seminal receptacles which generally contain sperm. The eggs are very large, 0·29 mm. × 0·087 mm.; 0·22 mm. × 0·094 mm.; 0·26 mm. × 0·093 mm., and although two eggs have been seen in some specimens there is generally only one present. It appears that the ovaries generally produce an egg alternately since it has been noted that the last cell in the ovarian part of the reproductive tract is generally much larger in the ovary opposite to that in which the egg is present in the uterus (Text-figs. 10 and 12). The eggs themselves appear to have a line round them about the mid-point of their lengths although this has not been seen in all the specimens. Its status is not clear since in all cases where such a line was present only one nucleus could be found so that it does not appear to represent the first division of the egg but may rather represent a modification of the egg shell or simply be due to fixation.

FIGS. 7–12. *Trissonchulus janetae* sp. nov. Fig. 7. Ventral view of spicules and gubernaculum. Fig. 8. Lateral view of anterior end of body showing structure of pharyngeal part of the oesophagus. Fig. 9. As Fig. 7, from the lateral aspect. Fig. 10. Female reproductive apparatus. Note flagellate sperm in oviducts. Fig. 11. Whole male. Fig. 12. Female reproductive apparatus. (Figs. 7 and 9; 10 and 12 to the same scale.)

Discussion

Schuurmans Stekhoven (1950) argues that *Trissonchulus* Cobb, 1920 should not be considered distinct from *Dolicholaimus* de Man, 1888, and Wieser (1953*b*) accepts this, since he could not see any difference between the two genera except the shape of the tail, which is long and narrow in *Dolicholaimus* and short, wide and blunt in *Trissonchulus*. Gerlach (1954) apparently accepts this since he does not include *Trissonchulus* in his key to the marine genera of the Ironidae. However, there does appear to be a further difference between the species with long tails and those with short. There is only a single dorsal tooth in those with long tails while some, at least, of the short tailed species are known to have two teeth dorsally. Five short tailed species have been described : *T. oceanus* Cobb, 1920 (type species of the genus) which was described as having three teeth ; *D. obtusa* Bresslau and Schuurmans Stekhoven, 1935 (in Schuurmans Stekhoven, 1935) described as having two teeth dorsally and two ventrally (Chitwood (in Chitwood & Chitwood, 1950) states that this species has three double equal odontia but gives no figure and has probably misunderstood the original description) ; *D. nudus* Schuurmans Stekhoven, 1943 has been described as having " three spears with biuncinate apex " (Schuurmans Stekhoven, 1950) but the figures do not support this interpretation and suggest that two teeth are present on the dorsal side of the head only ; *D. latus* Wieser, 1953*b*, in which the written description is very short, suffers because of Wieser's declared policy that " No organs will be described morphologically in the text if their structure can be inferred from the figure." (Wieser, 1953*b*, p. 8). Unfortunately Wieser only mentions three teeth and gives a figure which is on such a small scale that it is impossible to obtain any information about the structure or arrangement of the teeth. Finally Chitwood (1951) described *T. reversus* from a single juvenile, the teeth are not mentioned and the figure of the head does not allow the number of teeth to be established (see also Chitwood and Timm (1954) where Chitwood's 1951 figures are reproduced). In spite of this uncertainty about the number and arrangement of the teeth in the various short tailed species I think that the genus *Trissonchulus* should be recognized for the species with short, stout, blunt tails since I suspect that adequate morphological studies will demonstrate the presence of two dorsal teeth in them all. Even if this should not be so the difference between the tail shapes in the two groups certainly warrants generic separation. The genus *Trissonchulus* may be diagnosed thus :

Trissonchulus Cobb, 1920

Ironidae : sense organs of head papilliform ; mouth opening bounded by three lip-flaps ; two small teeth, identical in structure present on anterior end of dorsal sector of pharynx (?) ; one large tooth on each ventro-lateral sector (?) ; tail short, stout and blunt.

Type species : *Trissonchulus oceanus* Cobb, 1920.

Other Species : *T. obtusus* (Bresslau and Schuurmans Stekhoven in Schuurmans Stekhoven, 1935) comb. nov.; *T. nudus* (Schuurmans Stekhoven, 1943) comb. nov.; *T. reversus* Chitwood, 1951 ; *T. latus* (Wieser, 1953) comb. nov.; *T. janetae* sp. nov.

T. janetae is easily distinguished from all the other species of the genus *Trisson-*

chulus, except *T. reversus*; by the dorsal opening of the spinerette. Chitwood reports the same condition in *T. reversus* together with a figure of the tail and a figure of the anterior end of the body. The written description, which was based on one juvenile specimen, is otherwise restricted to the body length (1·16 mm.), the ratios *a* (29), *b* (3·2), *c* (16) and the length of the stoma (0·040 mm.) (= length of pharyngeal rods ?). Although this description leaves much to be desired the value for "*a*" is much lower than the values obtained for *T. janetae* larvae even when the differences

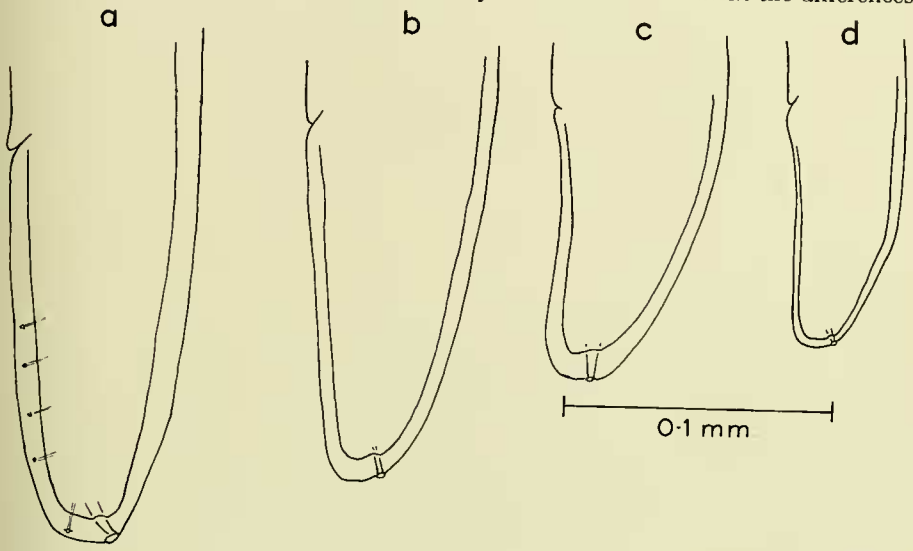


FIG. 13. Outlines of the tails of various specimens: *a* and *b*, adult females, *c*, adult male and *d*, larva. (All to same scale.)

between the lengths of the bodies is considered. The differences between the "*b*" values are probably not significant but "*c*" does appear to be sufficiently low to be significant. Nevertheless it is impossible to be sure of the relationship between *T. janetae* and *T. reversus* and I have considered it better to name the specimens from South Africa as new until the developmental stages of both nominal species are known.

Mesonchium nini sp. nov.

Material Studied

1 ♂, 2 ♀ B.M. (N.H.), Reg. Nos. 1960.297–299. ♂ selected as Holotype. The specimens are in a rather poor condition.

Proportions and Measurements (mm.).

	a	*b*	*c*	V	Body length
♂	36·4	9·5	13·9	—	1·93
♀♀	34·2	8·5	11·1	43·3	1·78
	45·2	8·2	11·3	48·6	2·08

Male (Holotype) : Oesophagus length : 0·204. Head diameter : 0·010. Pharynx depth : 0·021. Distance from anterior end to anterior edge of amphids : 0·006. Amphid diameter : 0·007. Diameter of head at amphid : 0·013. Diameter of amphid as percentage of head diameter : 53·8. Nerve ring from anterior end : 0·097. Excretory pore not seen. Tail length (tail length/anal diameter) : 0·139 (3·6). Spicule length : 0·082. Gubernaculum length (= length posterior apophosis) : 0·036.

Females (in order of body lengths) : Oesophagus length : 0·210 ; 0·253. Head diameter : 0·012 ; 0·010. Pharynx depth : 0·020 ; 0·023. Distance from anterior end to anterior edge of amphids : 0·004 ; 0·006. Amphid diameter : 0·008 ; 0·008. Diameter of head at amphid : 0·015 ; 0·016. Diameter of amphid as percentage of head diameter : 53·3 ; 50·0. Nerve ring from anterior end : 0·082 ; 0·089. Excretory pore not seen. Tail length (tail length/anal diameter) : 0·160 (4·3) ; 0·184 (4·7). Vulva from anterior end : 0·77 ; 1·01.

Cuticle

The surface of the body, dorsally and ventrally is marked by fine striations while the cuticle is differentiated laterally by a series of dots. This differentiation, from about the level of the posterior end of the oesophagus to just anterior to the cloacal opening or anus takes the form of two files* of large, rectangular, spectacularly distinct dots which lie in a strip of otherwise undifferentiated cuticle. There is, therefore, a clear space on each side of the files of dots. This clear strip is roughly twice as wide as the distance between the two files of dots so that the zones flanking the files of dots are roughly half the distance between two files in width. The clear space is bordered on both sides by a region, roughly the same width as the clear strip, in which the cuticle is differentiated by small dots of which one row corresponds with each set of large rectangular dots and one row corresponds with the space between each contiguous set of rectangles (Text-fig. 16). The clear space, which is about 0·007 mm. in width in all the specimens, is delimited from the outer small dots by a distinct line which may be an artifact. Anteriorly and posteriorly there are four files of smaller, squarer dots which lie equidistant from each other transversely, are not set off from the remainder of the cuticular markings by a clear space and are flanked by rather elongate cuticular markings arranged in rows which correspond one to each row of the larger lateral markings. The smaller elongate markings continue round the body so that there are no dorsal and ventral zones in which the cuticle is undifferentiated as there are on the body opposite the two files of large markings. Four files are present anteriorly from just posterior to the amphids to about the posterior end of the oesophagus (Text-fig. 18) and posteriorly from about the anus, or cloaca, almost to the tip of the tail. The transition from the four files to the two files is remarkably regular. Anteriorly the four files begin to approach each other in pairs until the individual elements of the four files fuse to produce the two files of larger rectangles characteristic of the middle region of the body (Text-fig. 16). At the same time the nature of the markings external to the files changes from the elongate form, in which

* *Files* refers to the arrangement of the dots in lines running antero-posteriorly and *Rows* refers to lines of dots running transversely on the body.

each row corresponds with each set of lateral markings, to the punctate form in which there is one row corresponding to each row of larger rectangles and one row between each row of rectangles. The lines bordering the undifferentiated strip in which the two files lie correspond exactly with the outer limits of the outer files of the four file zone. This explains why the large rectangles are separated from each other, radially, by a distance twice as great as the width of the clear zones which flank them. Because the four files have fused with perfect symmetry the two files lie exactly midway between the files of each pair in the four file zone (Text-fig. 16). The interpretation of the large dots as representing two fused small dots is confirmed by the presence among the former of many in which only one half is well developed or in which one half has completely failed to develop. The rate at which the four rows approach each other in pairs may vary so that in some cases there are three rows for a short distance. Posteriorly the same change occurs, except that it is reversed, the two files dividing into four as one passes posteriorly.

There are two files of relatively long setae running down each side of the body, one file on each side of the lateral differentiation.

Head and Oesophagus

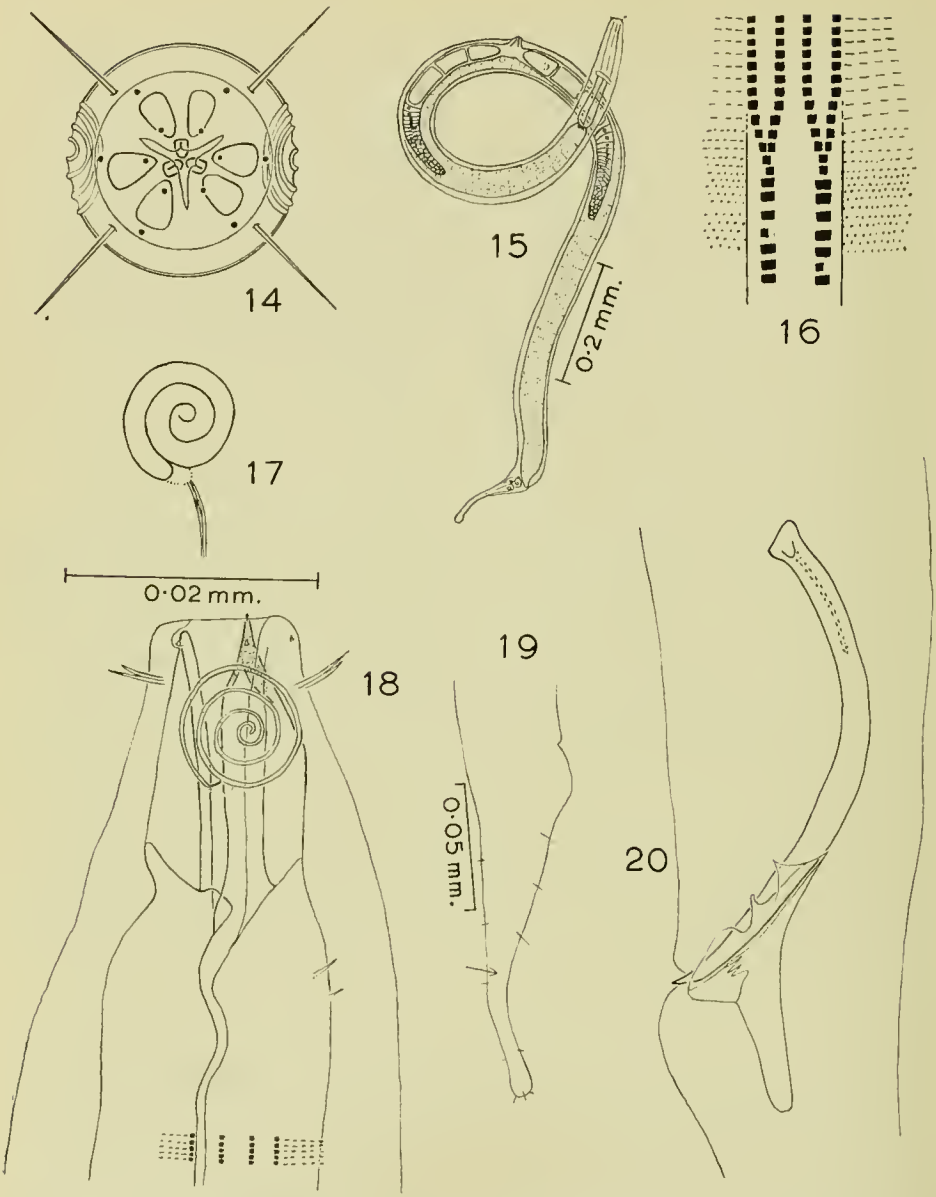
The amphids are spiral and lie relatively far posterior to the anterior end of the body. Both on one female have three and three quarter spirals (Text-fig. 18), both on the male have three and a quarter (Text-fig. 17) while on the second female the left amphid has three and three quarter spirals and the right has three and a quarter. It should be noted that the difference is restricted to the central part of the spiral. The amphidial spiral, which is an open groove, leads into a covered pouch from which the amphidial nerve leaves, so that the innervation of the amphid is posterior.

The mouth opening is bounded by three lip-flaps which are slightly incised centrally so that they are partly bi-lobed (Text-fig. 14). There are two circles of six small sessile papillae and more posteriorly there is a set of four long setae, 0·007–0·008 mm. in length.

The oesophagus is roughly the same width along its whole length except for a slight even swelling at the posterior end (Text-fig. 15). Anteriorly there are three teeth of which the two ventro-lateral are stouter than the dorsal and project further anteriorly (? artifact) (Text-fig. 18). The thickened cuticle which forms these teeth is continued posteriorly for about 0·020 mm. (see above, pharynx depth) as a lining to the anterior end of the oesophagus.

Male

The spicules are slightly curved, simple, identical without alae or other elaborations and terminate posteriorly in sharp points. The gubernaculum has a distinct posterior apophosis and appears to curve round the spicules proximally. The outline of the part of the gubernaculum which enfolds the spicules is irregular (see Text-fig. 20) and while I am sure that the large mass at the cloacal opening end of the gubernaculum is accurate the presence of the other two protuberances is less certain. There are no pre-cloacal supplements and there do not appear to be any special caudal setae. This is however, most uncertain since many of the setae on the body of the



FIGS. 14–20. *Mesonchium nini* sp. nov. Fig. 14. *En face* view of head. Fig. 15. Whole body of female. Fig. 16. Lateral differentiation of body about level of posterior end of oesophagus (semi-diagrammatic). Fig. 17. One form of amphid. Fig. 18. Lateral view of head, dorsal side to the right, showing another variation of the amphid. Fig. 19. Lateral view of female tail, arrow indicates point at which lateral differentiation stops. Fig. 20. Structure of the spicules and gubernaculum from the lateral aspect. (Figs. 14, 17, 18 and 20 to the same scale.)

male specimen appear to have been broken off. Anterior to the cloacal opening are about 25–26 oblique, dorso-ventral muscle strands.

Female

The female tail is identical in outline with that of the male (Text-fig. 19). There are two opposed uteri (Text-fig. 15) and the ovaries are not reflexed. The eggs are 0·069 × 0·032 mm. and there are three in each uterus.

Discussion

This species appears to be very similar to *Mesonchium poriferum* Cobb, 1920, the type species of *Mesonchium*, particularly in the structure of the head, the form of the amphids, the structure of the spicules and gubernaculum and the type of lateral differentiation. In *M. poriferum* Cobb (1920) reports the presence of two rows of lateral gland pores lying outside the lateral differentiation which takes the form of three rows of round cuticular elements in the female and two in the male. The so called lateral gland pores may, in fact, have been the bases of lateral rows of setae which had become broken. Wieser (1954*b*) treats *Pepsonema* Cobb, 1920 as a synonym of *Mesonchium* which appears reasonable. The great similarity between the descriptions of *M. poriferum* and *P. pellucidum* is also clear from the characters by which Chitwood (1951) attempted to separate the two species in his key, *M. poriferum* : Ovaries reflexed ; *P. pellucidum* : ovaries outstretched, in spite of Cobb's statement that in the latter species " The ovaries may be reflexed for a short distance near their blind ends." while in the former " An unusual feature is that the ovaries are reflexed only near their blind ends." *P. pellucidum* appears to differ from *M. poriferum* mainly in the form of the lateral differentiation of the cuticle which is described as " . . . of medium thickness. Anteriorly the number of the longitudinal rows of " beads " appears to be fewer than near the tail, where there are sometimes six or possibly eight rows."

Mesonchium nini can, therefore, be distinguished by the form of the lateral differentiation and possibly by other characters but the descriptions of Cobb's species are insufficient to allow this to be established.

Hypodontolaimus angelae sp. nov.

Material Studied

4 ♂ (one badly damaged, no head), 2 ♀. B.M. (N.H.), Reg. Nos. 1960, 304–309. 1 ♂, 1960, 304 selected as Holotype.

Proportions and Measurements (mm.)

	a	*b*	*c*	V	Body length
♂♂	22·6	7·9	9·1	—	1·04
	25·8	7·3	8·2	—	0·98
	22·3	6.3	9·9	—	1·07
♀♀	24·7	7·1	8·1	43·6	1·01 (? 4th larva)
	25·9	8·1	9·2	45·4	1·19

Males (measurements in same order as above): Oesophagus length: 0·132; 0·134; 0·170. Head diameter: 0·014; 0·013; 0·014. Oesophageal bulb, length: 0·031; 0·031; 0·039. Oesophageal bulb, breadth: 0·024; 0·024; 0·023. Nerve ring from anterior end: 0·079; 0·082; ... Excretory pore: not seen. Tail length (tail length/anal diameter): 0·114 (3·9); 0·120 (3·9); 0·108 (3·2). Spicule length, across chord: 0·038; 0·037; 0·036. Gubernaculum length: 0·030; 0·027; 0·028.

Females: Oesophagus length: 0·142; 0·147. Head diameter: 0·014; 0·014. Oesophageal bulb, length: 0·033; 0·041. Oesophageal bulb, breadth: 0·023; 0·026. Nerve ring from anterior end: 0·079; 0·076. Excretory pore: not seen. Tail length (tail length/anal diameter): 0·124 (4·7); 0·129 (4·6). Vulva from anterior end: 0·44; 0·54.

Cuticle

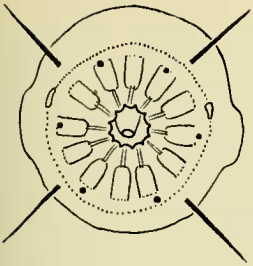
The lateral differentiation starts relatively close to the head and between the head and this point the body is marked by a few rows of circular punctations. Passing posteriorly the cuticle becomes laterally differentiated, with lateral bars which are flanked by large circular dots, one on each side. The remainder of the body is covered by rows of smaller dots (Text-fig. 22, *a*). The main dots become gradually smaller posteriorly while those outside them become narrower and elongate in an antero-posterior direction. From about the level of the posterior end of the oesophagus to just anterior to the level of the anus or cloacal opening the punctations are restricted to a strip on either side of the lateral bars, each strip being roughly the same width as the barred strip (Text-fig. 22, *b*) which varies from 0·003–0·004 mm. just posterior to the head; to 0·004–0·006 mm. about the middle of the body length and becomes narrower again about the level of the anus or cloacal opening where it is 0·003–0·004 mm. in width. The lateral fields are distinctly raised above the remainder of the body surface (Text fig. 21).

There are two files of setae down each side of the body of which the setae are much closer together anteriorly, where they are 0·007–0·008 mm. in length (that is they are longer than the cephalic setae which are 0·006 mm. long), than they are more posteriorly.

Head and Oesophagus

The head is somewhat contracted in all the specimens and, perhaps because of this, an inner circle of papillae has not been seen. One circle of six small, sessile papillae has been seen and there are four long cephalic setae dorso- and ventro-lateral in position (Text-fig. 21). The amphids are latero-subdorsal in position but they are difficult to see and their shape is not clear. The mouth opening is surrounded by the usual twelve ribs which are in two parts, a thick posterior part and an anterior thin part.

The oesophagus has a distinct posterior bulb (Text-fig. 23) and is slightly swollen anteriorly, particularly on the dorsal side, by the muscles which supply the oeso-



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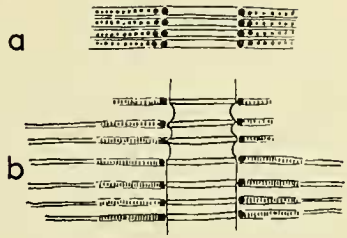

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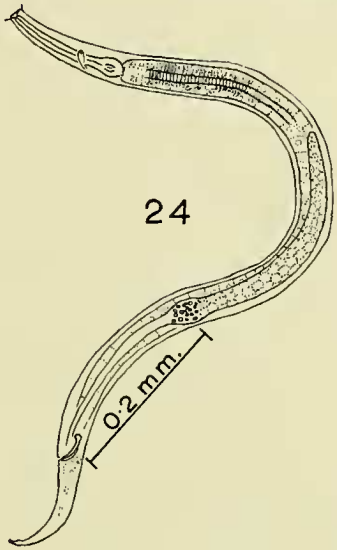

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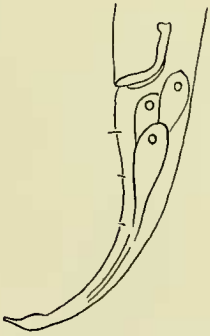

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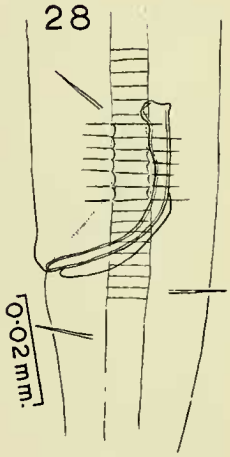

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FIGS. 21–28. *Hypodontolaimus angelae* sp. nov. Fig. 21. *En face* view of head Fig. 22. Detail of lateral differentiation. *a*, Anterior end of body. *b*. Middle part of body (semi-diagrammatic). Fig. 23. Lateral view of oesophagus. Fig. 24. Whole male, note single gonad. Fig. 25. Detail of extreme tip of tail showing shape of spinerette. Fig. 26. Lateral view of head, dorsal surface to the right. Fig. 27. Male tail from the lateral aspect. Fig. 28. Details of spicules and gubernaculum from the lateral aspect. (Figs. 21 and 26 ; 23 and 27 ; 25 and 28, to same scale.)

phageal teeth. There is one small, solid (?) tooth developed from each ventro-lateral sector and a large, hollow S-shaped dorsal tooth (Text-fig. 26). In addition there is a series of denticles, apparently developed along the anterior edge of the ventral radius of the oesophageal lumen and also along the more ventral of the edges of the dorso-lateral radii. Whether such a series is also present along the dorsal edge of the dorso-lateral radii is not clear but probably it is not since the dorsal tooth appears to be due to a thickening of the cuticle along the inner edge of the dorsal sector while the ventro-lateral teeth appear to be due to the thickening of the cuticle at the apex only of each ventro-lateral sector.

Tail

The tail is relatively long and thin with a very long, narrow spinneret (Text-figs. 25 and 27).

Male

The spicules are fairly strongly curved and are roughly the same width along most of their length. Anteriorly there is a distinct swelling for the attachment of the retractor muscles and just posterior to this the spicule narrows rather suddenly. The posterior ends of the spicules are bluntly rounded. The spicules appear to bear thin alae running from the tip to the point near the anterior end where the shaft suddenly narrows but this is uncertain. The gubernaculum is simple (Text-fig. 28). There is one testis with a distinct seminal vesicle (Text-fig. 24).

Female

There are two opposed uteri but due to the poor condition of the specimens the arrangement of the ovaries could not be definitely determined although they appear to be reflexed. The eggs, of which the maximum number seen in one specimen is two, one in each uterus, are spherical, 0·028 mm. in diameter.

Discussion

Hypodontolaimus angelae appears to be most similar to *Hypodontolaimus geophila* (de Man, 1876) in possessing a gubernaculum without an apophysis and in having two longitudinal rows of large dots separated by bars. The shape of the spicules in *H. angelae* is different with the definite constriction near the anterior end, which is not present in *H. geophila,* and with bluntly rounded posterior tips, these being sharply pointed in *H. geophila.* These differences have been confirmed by comparing the specimens of *H. angelae* with some of *H. geophila.* The position is, however, complicated by the somewhat unsatisfactory nature of the classification within the subfamily Chromadorinae, particularly the separation of the genera *Hypodontolaimus* and *Dichromadora.* Wieser (1954*b*) separates them almost wholly on the shape of the dorsal tooth, S-shaped in *Hypodontolaimus* and not so shaped in *Dichromadora.* Such a character, although clear in a specimen with a large tooth, is not at all clear in species in which the tooth is small. While I recognize that a character is not invalid because it is difficult to establish, the published descriptions of the species which

Wieser distributes between these two genera do not convince me that this is a satisfactory basis for a classification. However I am unable to suggest a better grouping now but, because of this difficulty, I have also compared *H. angelae* with the species referred to *Dichromadora*. Among them *H. angelae* appears to be most similar to *D. punctata* Schuurmans Stekhoven, 1950. As Wieser (1954*b*) points out the description given by Schuurmans Stekhoven is poor but *H. angelae* differs from *D. punctata* in the shape and position of the amphids and the shape of the spicules.

Wieser (1954*b*) treats *Spilophora canadensis* Cobb, 1914 as a synonym of *H. geophila* but this I cannot accept. The description given by Cobb is insufficient to determine either the systematic position or the specific validity of his species and until specimens from a comparable locality have been studied *S. canadensis* should be considered a *species inquirendum*.

Polygastrophora omercooperi sp. nov.

Material Studied

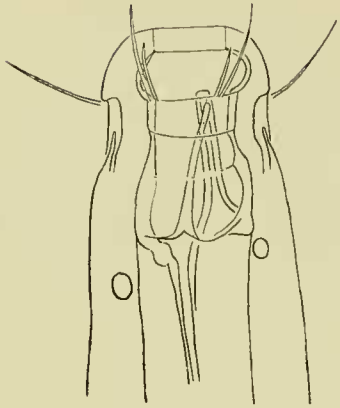
15 ♂ (1 without a head); 7 ♀ (1 immature); 1 4th stage ♀ larva. B.M. (N.H.), Reg. Nos. 1960, 273–296. Holotype ♂ selected, 1960, 273.

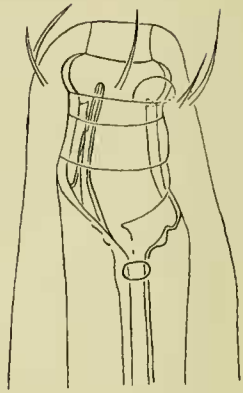
Proportions and Measurements (mm.)

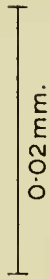
	a	*b*	*c*	V	Body length
♂♂	34·4	4·5	17·8	—	3·24
	35·4	5·1	16·1	—	2·90
	32·1	4·1	15·0	—	2·60
	36·7	5·2	16·3	—	3·30
	37·0	4·5	17·8	—	3·55
♀♀	32·0	4·7	15·7	52·5	3·14
	34·3	4·1	14·7	59·6	2·92
	31·1	4·2	16·0	55·7	3·05
	32·4	4·9	15·4	56·2	3·13

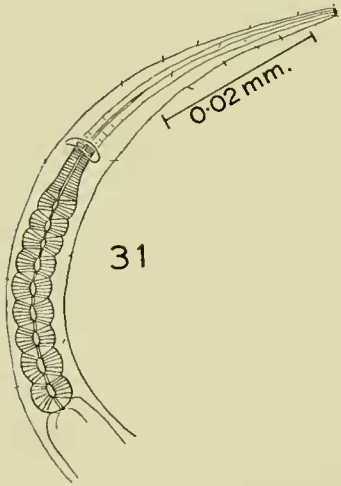
Males (measurements in order of body lengths): Oesophagus length: 0·72; 0·59; 0·63; 0·64; 0·79. Buccal cavity depth: ——; ——; 0·017; 0·016; 0·018. Buccal cavity width: ——; ——; 0·005; 0·006; 0·006. Refractive bodies from anterior end: ——; ——; 0·018; 0·016; 0·019. Nerve ring from anterior end: ——; ——; 0·278; 0·340; 0·371. Excretory pore from anterior end: only seen in the 3·55 mm. long specimen, 0·077. Tail length (tail length/anal diameter): 0·186 (3·5); 0·180 (——); 0·173 (3·4); 0·203 (4·2); 0·199 (3·8). Spicule length: 0·28; 0·26; 0·26; 0·26; 0·28. Gubernaculum length: 0·045; 0·039; 0·041; 0·036; 0·046.

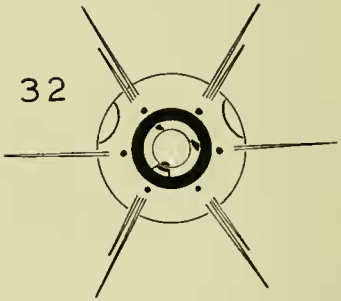
Females (all measurements in order of body lengths): Oesophagus length: 0·67; 0·72; 0·74; 0·64. Buccal cavity depth: 0·016; 0·015; 0·016; 0·016. Buccal cavity width: 0·006; 0·005; 0·006; 0·007. Refractive bodies from anterior end: 0·018; 0·019; 0·019; 0·019. Nerve ring from anterior end: 0·041; 0·039; 0·036; 0·038. Excretory pore from anterior end: 0·074; 0·072; ——; 0·074. Tail length (tail length/anal diameter): 0·200 (4·1); 0·191 (4·0); 0·198 (4·3); 0·203 (3·9). Vulva from anterior end: 1·65; 1·70; 1·74; 1·76.











FIGS. 29–32. *Polygastrophora omercooperi* sp. nov. Fig. 29. Dorsal view of female head. Note the recessed amphids. Fig. 30. Lateral view of female head, dorsal side to the right. Fig. 31. Lateral view of the oesophagus, note nine bulbs. Fig. 32. *En face* view of female head. Note large tooth is right ventro-lateral in position. (Figs. 29, 30 and 32 to the same scale.)

Head and Oesophagus

The anterior end of the body narrows rapidly from about the posterior end of the oesophagus forward so that the head, in spite of the length of the body, is small, 0·010–0·011 mm. in diameter. There are many setae scattered over the anterior end of the body but they become progressively less common posteriorly until they are very rare posterior to the nerve ring. The mouth opening is circular, 0·004 mm. in diameter (in a male specimen 3·30 mm. long) and leads into a typical long, relatively narrow buccal cavity with parallel sides, except for the first chamber which is wider than the posterior chamber. The first chamber is 0·007 mm. in diameter, the second is 0·006 mm. The buccal cavity is divided into four parts by transverse rings, one at the opening of the swollen anterior chamber, one at the junction of that chamber and the narrower posterior chamber and two in the narrow chamber itself (Text-figs. 29 and 30). The small size of the head makes study difficult so that although small teeth appeared to be present on all three of the more anterior rings—on only one ring in some specimens, on two in others and on all three in some—I cannot be sure that they are a constant character of the species or whether in fact the serrated appearance is not an artifact. The transverse rings are therefore shown untoothed in the figures of the head (Text-figs. 29 and 30). Three teeth are developed from the base of the second chamber of the buccal cavity. The largest springs from the right ventro-lateral sector and the other two, which are much less prominent and equal in length, spring from the left ventro-lateral and the dorsal sectors of the oesophagus. Although in the *en face* figure of the head (Text-fig. 32) the dorsal tooth appears to be dorso-lateral in position and the left ventro-lateral appears to be lateral this is due to a slight spiralling of the teeth as they pass anteriorly. This is shown in the figure of the head from the dorsal aspect (taken from a different specimen from that used for the *en face* preparation) where it can be seen that their origins are wholly dorsal and ventro-lateral. The transverse rings appear to represent, from the anterior end to the posterior end (1) the junction of the mouth with the expanded anterior chamber; (2) the junction of the expanded chamber with the narrow chamber; (3) the level at which the dorsal and left ventro-lateral teeth become free at their anterior ends from the wall of the narrow chamber and (4) the level at which the large right ventro-lateral tooth becomes free from the narrow chamber. It follows from this that, as described above, there are only two true chambers the other rings only being apparent from certain angles as has been confirmed by rolling some of the specimens. This probably explains some of the discrepances between some of the descriptions of the species of this genus.

The mouth is surrounded by six small, sessile papillae and the head bears five pairs of long setae which originate about the level of the junction between the anterior and posterior chambers of the buccal cavity. Of these setae three pairs are long, 0·008 mm. in all the specimens measured, and two pairs are short, about 0·006 mm. The distribution of the setae is most easily understood from the figure (Text-fig. 32). The amphids are located about the level at which the cephalic setae originate and are dorso-lateral in position. They are semi-circular recesses which lead into pouches at the bases of which are the amphidial nerves (Text-figs. 29 and 30).

The oesophagus (Text-fig. 31) is very narrow anteriorly without any muscle bands

which only become obvious just anterior to the nerve ring. Approximately the posterior third of the oesophagus is developed into nine bulbs each of which contains a central lenticular cuticularization from which radiate stands of muscles. In some specimens a tenth, very small and poorly developed bulb appears to be present but it is probably that this is simply an artifact.

The usual pair of lenticular refractive bodies is present about the posterior end of the buccal cavity. The bodies show some variation in their positions relative to the buccal cavity, both from specimen to specimen and between the two sides of the same specimen but in no case were they seen anterior to the posterior end of the buccal cavity.

Male

All the specimens appear to be larvae (4th stage: but see below, page 312) since the structure of the head is identical with that of the female. The tail is relatively long and the three caudal glands are located relatively far anterior to the cloacal opening. The spicules are long and narrow, equal in length and identical in structure. There is a small, simple gubernaculum. Anterior to the cloacal opening, on the ventral surface of the body, are six pairs of relatively evenly spaced papillae, although in some specimens they are further apart anteriorly than posteriorly. Also anterior to the cloacal opening is a series of oblique muscle strands running from the dorsal to the ventral surface of the body over a length of 0·89–0·92 mm. from the cloacal opening. There are two opposed testes, which are restricted to the anterior half of the body, and a heavily muscled ejaculatory duct.

Female

The tail is similar in outline to that of the male. There are two opposed uteri which are not (?) reflexed. The eggs are 0·041 × 0·024 mm. to 0·043 × 0·025 mm. in size and the greatest number seen in one specimen was one in each uterus.

Discussion

Polygastrophora omercooperi is distinct from all the other species referred to the genus by the presence of nine bulbs in the posterior end of the oesophagus.

Wieser (9953*a* and *b*) suggests that all the genera referred to the subfamily Enchilidiinae may be characterized by sexual dimorphism and points out that it is definitely known to occur in three of the genera of that subfamily, one of the genera in question being *Polygastrophora*. However, I find it difficult to believe that all the male specimens I have seen are fourth stage larvae as in many of them the reproductive organs appear to be fully developed and the spicules are frequently protruded from the cloacal opening. In addition it is difficult to believe that among nineteen male specimens found in association with gravid females none of the males is fully adult but that many of them are fourth stage larvae just about to moult to the adult condition. I therefore suggest that it is more probable that sexual dimorphism, involving a highly modified head in the male, does not necessarily occur in all the species of the

genus *Polygastrophora* but only in some of them. In fact such a male is only known in *P. quinquebulba* Micoletzky, 1930.

Allgén (1959) describes a new species of *Bolbella*, *B. cylindricauda*, based on one female specimen. Although the description is extremely poor, without measurements other than a statement of the length of the body and the values of *a*, *b* and *c* ("The vulva was not to be stated."), it is clearly a species of *Polygastrophora* since Allgén refers to " light-refracting small bodies behind the buccal cavity ". Such bodies are characteristic of *Polygastrophora* but do not occur in *Bolbella* as Wieser points out (1953*b*, p. 132). Further Allgén draws attention to the similarities between his new species and the redescription of *Polygastrophora hexabulba* (Filipjev, 1918)—which Allgén attributes to Wieser—given by Wieser (1953*b*). While acknowledging that Allgén's description is insufficient and that his figures are virtually impossible to analyze, I have little doubt that *B. cylindricauda* is the same species as that described by Wieser as *P. hexabulba*, since the characters on which Allgén considers them distinct are such as could be due to poor preservation. Certainly the figure of the tail (Allgén, 1959, fig. 83*c*) could only have been drawn from a distorted specimen. I therefore propose that *B. cylindricauda* Allgén, 1959 be treated as a synonym of *P. hexabulba* (Filipjev, 1918).

Sphaerolaimus anterides sp. nov.

Material Studied

0 ♂ ; 4 ♀ (2 adult, 2 4th stage larvae). B.M. (N.H.), Reg. Nos. 1960.300–303. One adult female selected as Holotype, 1960.300.

Proportions and Measurements (*mm.*)

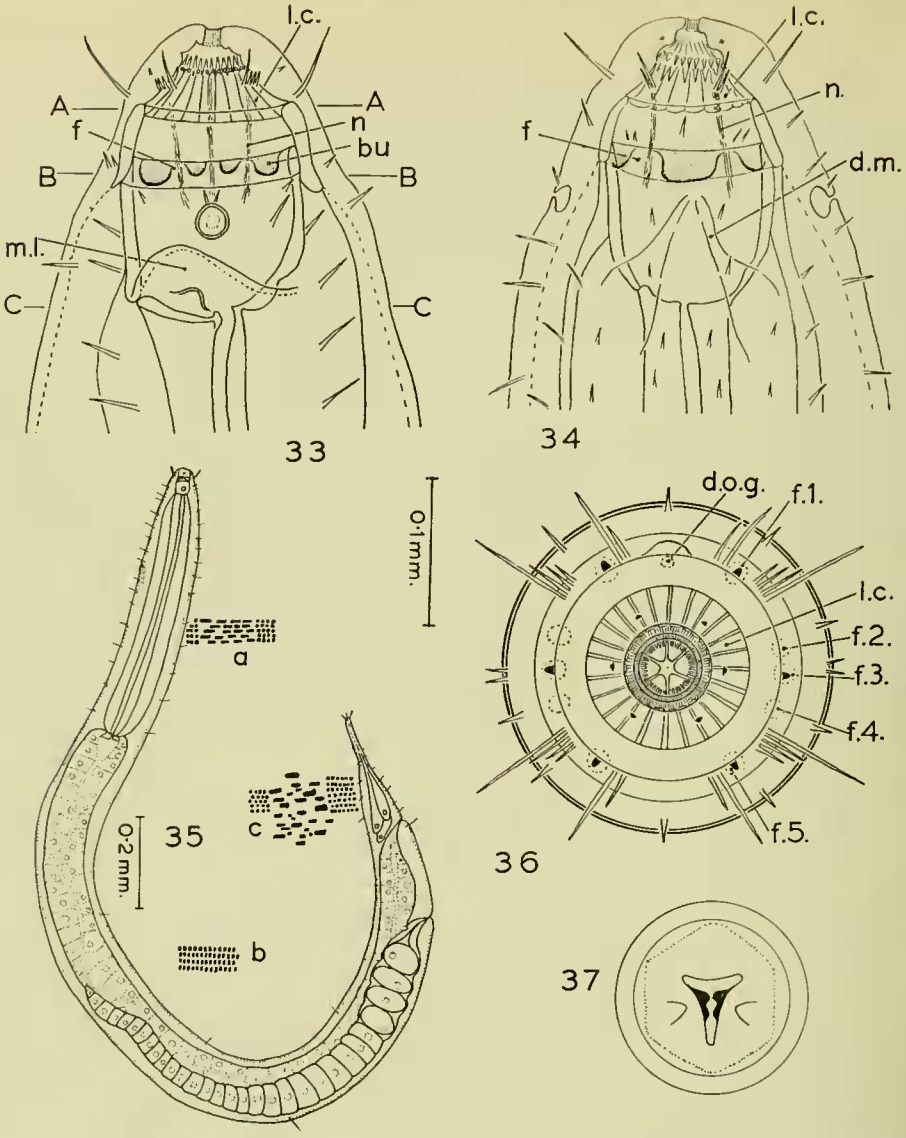
a	*b*	*c*	V	Body length
19·7	4·0	9·9	82·8	2·38
19·6	4·6	10·5	83·2	2·74
16·4	3·9	9·7	83·3	1·74 (larva)

Adult (in order of body lengths) : Oesophagus length : 0·59 ; 0·59. Head diameter at "A" (see Text-fig. 33) : 0·041 ; 0·037, at "B": 0·057 ; 0·053, at "C": 0·068 ; 0·071. Amphid diameter (percentage of corresponding head diameter) : 0·006 (10·5) ; 0·006 (11·3). Buccal capsule diameter : 0·027 ; . . . . Buccal capsule depth : 0·015 ; . . . . Nerve ring from anterior end : . . . ; 0·19. Excretory pore from anterior end : 0·21 ; . . . . Tail length (tail length/anal diameter) : 0·24 (3·1) ; 0·26 (3·8) Vulva from anterior end : 1·97 ; 2·28.

Larva : Oesophagus length : 0·45. Head diameter at "A" : 0·037, at "B": 0·050, at "C": 0·061. Amphid diameter (percentage of head diameter) : 0·007 (14·0). Nerve ring not seen. Excretory pore from anterior end : 0·18. Tail length (tail length/anal diameter) : 0·18 (2·1). Vulva from anterior end : 1·45.

Cuticle

The cuticle bears very fine, close-set transverse striations, about 0·001 mm. apart, over most of the body, which resolve into series of small rectangular blocks (Text-fig.



FIGS. 33–37. *Sphaerolaimus anterides* sp. nov. Fig. 33. Lateral view of head. Dorsal side to the right. Fig. 34. The same from the dorsal surface. Fig. 35. Whole body. Note posterior position of vulva and only one ovary. *a* = cuticular markings on anterior end of body. *b* = cuticular markings on middle part of body. *c* = irregular markings about level of anus (semi-diagrammatic). Fig. 36. *En face* view of head. Fig. 37. Optical section through oesophageal funnel showing ventro-lateral teeth. (Figs. 33, 34, 36 and 37 to the same scale.) (A———A, B———B and C———C indicate levels referred to in the text. l.c. = leaf crown; n = nerves supplying cephalic sense organs; bu = buttresses of buccal capsule; f = foramina; m.l. = muscular lobes developed on the ventro-lateral sides of the oesophageal funnel; d.m. = dorsal muscle fibres of oesophageal funnel; d.o.g. = duct of dorsal oesophageal gland; f_1–f_5 = foramina.)

35, *b*). The markings start anteriorly about the level of the anterior edge of the buccal capsule (Text-fig. 33, level "A") where they are regular and slightly more elongate than those on the major part of the body. More posteriorly, particularly around the amphid, the blocks on the lateral fields become longer, more prominent and slightly irregular both in shape and distribution (Text-fig. 35, *a*), although never to the same extent as the markings on the posterior end of the body (see below). This anterior zone of larger markings continues posteriorly, narrowing evenly until it disappears about the level of the posterior end of the oesophagus, the smaller blocks flanking the lateral zone becoming smaller and squarer concomitantly. On the posterior end of the body, about the level of the anus, the regular arrangement is also lost and is replaced by blocks along the lateral fields which are very irregular in arrangement and shape. The area so covered is V-shaped with the wider part anteriorly. The regular arrangement persists dorsally and ventrally (Text-fig. 35, *c*).

There are many longish setae, about 0·006 mm. long, arranged in sixteen evenly spaced files. The setae are relatively close together anteriorly but become further apart posteriorly until they cease about the level of the posterior end of the oesophagus The remainder of the body bears only a few setae but they become more frequent again on the tail (Text-fig. 35).

Head and Oesophagus

The head bears two circles of six sessile papillae of which those of the inner circle are small and inconspicuous while those of the outer are fairly prominent, but are not setiform (Text-fig. 36). Slightly posterior to the outer circle of papillae is a circle of four sets of setae of which one seta is much longer (0·012-0·013 mm. on the adults 0·011 mm. on the larvae) than the other three and is the most lateral in all four groups. The other three setae are of different lengths, becoming shorter the more dorsal or ventral (depending on the group to which they belong) their position. These four groups are dorso- and ventro-lateral in position (using the terminology of de Coninck (1942) and Hyman (1951), p. 201, fig. 94). Immediately posterior to this circle is another, also consisting of four groups of setae, but of only two setae per group. In this case also the more lateral seta is longer than the other in each group. There are further small setae which appear to correspond to those covering the general surface of the anterior end of the body except that the first circle consists of eight setae instead of sixteen as on the remainder of the body. In addition there are two small setae immediately anterior to each amphid.

The mouth opening is circular in shape and is closed by six fleshy lip-lobes which appear to be striated radially, but it is possible that this appearance is due to the underlying longitudinal striations of the cavity anterior to the leaf elements (= vestibule) (see below). The mouth leads through the vestibule into a capacious, globular buccal cavity which is bordered anteriorly by a set of leaf elements forming a leaf crown (I am applying the terminology used in the strongyloids, a group of parasitic nematodes, see below, page 317). Posterior to the leaf crown the buccal cavity consists of two distinct parts the more anterior of which, between levels "A" and "B"(see Text-figs. 33 and 34) will be referred to as the buccal capsule while the more posterior

will be referred to as the oesophageal funnel (another term applied to the strongyloids). The buccal capsule is circular in cross section and the leaf crown (Text-fig. 36, l.c.) is composed of twenty five leaf elements which arise as thin cuticular strips from the inner surface of the buccal capsule just posterior to its extreme anterior edge. Anterior to the leaf crown there appears to be a second leaf crown consisting of much smaller leaf elements but this effect is due to the longitudinal folding of the cuticle lining the vestibule whih produces longitudinal striations (see Cobb, 1929). The posterior end of the buccal capsule lies over the wall of the oesophageal funnel as twelve " buttresses " (Text-figs. 33 and 34, *bu*) which are the only sclerotized parts of the buccal capsule i.e. they show up distinctly even under very low powers and appear to be covered by small dots. These buttresses are extremely prominent and appear to be characteristic of this species. Further, the buccal capsule is fused to the body wall by these butttresses and the nerves which supply the cephalic setae and papillae can be seen passing through the spaces between them (" *n* "). These spaces are represented on the *en face* view of the head (Text-fig. 36) by somewhat oval spaces enclosed by dashes (" *f* "), since this is the impression they give, although a more detailed study shows that they are in fact bounded internally by the buccal capsule and/or the wall of the oesophageal funnel and externally by the cuticle covering the body. The oesophageal funnel is massive and appears to be divided into two parts. There are two well developed teeth at the base of the funnel, one on each ventro-lateral sector (Text-fig. 37). There is no corresponding tooth dorsally but there is a marked thickening of the dorsal wall of the oesophageal funnel through which passes the duct of the dorsal oesophageal gland (Text-fig. 36, *d.o.g.*). The musculature of the ventro-lateral sectors of the oesophagus continues anteriorly as two lobes (Text-fig. 33, *m.l.*) which stop about the middle of the oesophageal funnel. There are no lobes dorsally although there is a slight development of muscles in two separate blocks (Text-fig. 34, *d.m.*). The oesophageal funnel is circular in cross section anteriorly but becomes hexagonal in cross section internally towards the bottom (Text-fig. 37).

The amphids lie anterior to the base of the oesophageal funnel, roughly half way between the posterior and anterior ends. They are circular in outline and the opening is a small circle leading into a larger cavity. Most figures show only a large circle which may have been due to the authors overlooking the small circle of the opening, but there may in fact be a difference in the form of the amphids. The amphidial nerve appears to enter from the posterior side but a slight break in the outer periphery in one specimen suggests that the nerve may in fact enter from the dorsal side, but I cannot be sure owing to the difficulty of seeing the nerves.

The oesophagus is stout without a posterior swelling and is lined by thick cuticle along its whole length.

Tail

The tail narrows suddenly about two-thirds of its length posterior to the anus and bears several rows of relatively long setae. There are three very distinct, stout setae on the extreme tip of the tail which are about 0·014 mm. long in the adults and 0·009 mm. long in the larvae. The three caudal glands are located immediately posterior to the anus (Text-fig. 35).

Reproductive Apparatus

There is a single ovary which is not reflexed and there does not appear to be a distinct oviduct. The eggs, of which the greatest number seen in one specimen was four, measure 0·063 × 0·051 mm. and 0·069 × 0·056 mm. The vulva lies relatively far posterior to the head, $V = 83$, and there is no post-vulvar sack (Text-fig. 35).

Discussion

Sphaerolaimus anterides belongs to what may be called the Parasphaerolaimus-group of the genus *Sphaerolaimus*, a group characterized by a reduced buccal capsule (in the nomenclature used here ; " sclerotized portion " of Wieser (1956) ; " chagrinierter Teil " in German literature ; " chagrinated cuticularized plates " of Schuurmans Stekhoven (1950)). This group contains three species, according to Wieser (1956), *S. dispar* Filipjev, 1918 ; *S. paradoxus* Ditlevsen, 1919 and *S. islandicus*. Ditlevsen, 1926 ; from all of which *S. anterides* differs in the form of the buccal capsule, perhaps in the presence of cuticular differentiation on the body (this character is doubtful since such markings may have been overlooked) and, apparently, in the length and distribution of the cephalic setae. The position is complicated, however, by the unsatisfactory nature of some of the descriptions and figures. One further species referable to the Parasphaerolaimus-group has been described since Wieser, *S. lodosus* Gerlach, 1954. Gerlach's full description brings out the many resemblances between his species and *S. anterides* but they differ in the cuticular pattern and the structure of the buttresses of the buccal capsule.

The use of the terms " leaf crown " and " oesophageal funnel " is not to be taken as indicating any homology between the structures so named in *Sphaerolaimus* and in the strongyloids. They are used solely as descriptive terms since there is a marked similarity in appearance between the two head forms. Such descriptions are used in preference to more specific terms such as cheilorhabdions, a term employed by Chitwood (in Chitwood and Chitwood, 1951) and by Wieser (1956) for what are referred to above as leaf elements, since such a term carries a concept of homology which may be unfounded and certainly is not satisfactorily established.

The great depth and diameter of the buccal cavity (i.e. the entire cavity stretching from the mouth opening to the posterior end of the oesophageal funnel) must introduce serious mechanical weaknesses which have been overcome by the attachment of the buccal capsule to the body wall by means of the buttresses. Since some provision must be made for the passage of the nerves which supply the sense organs of the head this fusion is incomplete leaving ten foramina (Text-figs. 33, 34 and 36, *f*) through which the nerves pass. The foramina being flanked by the buttresses. Thus the nerves which supply the four sets of four setae pass through the dorsal and ventral foramina of each lateral set of three (*f*2 and *f*4, Text-fig. 36). The nerves which supply the four sets of two setae pass through the dorso- and ventro-lateral foramina (*f*1 and *f*5) and the nerves which supply the dorso- and ventro-lateral papillae of the inner and outer circles pass through the same foramina (i.e. *f*1 and *f*5) while the nerves supplying the lateral papillae of both circles pass through the lateral foramina (*f*3). Several minor nerves supplying the various supernumerary setae of the head also pass through the

foramina. Such foramina appear to be present in all species of *Sphaerolaimus* but appear to be much more prominent in the species of the Parasphaerolaimus-group (see, for example, Schuurmans Stekhoven (1950), figs. 127 and 128 ; Gerlach (1954) Tafel XVII, Abb. 24*a*, *b*, *c* ; and Filipjev (1918) figs. 69*a*, *b*, *f*). The foramina should not, however, be confused with the fenestrae which occur in some of the species of the Sphaerolaimus-group of species and which appear to represent a tendency towards the lightening of the buccal capsule.

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